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COMPENSATION
PROGRAM

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Rocky Marsh Wetland Enhancement Project

M. Clark
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PWFWCP Report No. 235

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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We are grateful to the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP) for providing the opportunity for this project to happen, especially Fraser Corbould who was instrumental in working with Ducks Unlimited (DU) to make this project happen. Many organizations from the Mackenzie area worked with PWFWCP and DU to ensure that the project could happen: the Mackenzie Boy Scouts, Mackenzie Cadets, Mackenzie High School - Woodlot Forestry Program, Rocky Mountain Riders Snowmobile Club, Mackenzie Fish and Game Association, and Mackenzie Nature Observatory. Further to this, several government sections provided support to the project. These included the Ministry of Forests, Ministry of Environment, Lands and Parks, and District of Mackenzie. There was also a very important local sponsor, Donohue Forest Products Inc., who donated a considerable amount of lumber for the viewing site and a small footbridge.

1.0 INTRODUCTION

The Peace/Williston Fish and Wildlife Compensation Program (PWFWCP) undertakes wetland inventories and enhancement projects as part of its mandate to enhance and protect wildlife species and habitat in the Williston Reservoir watershed (Davidson and Dawson 1990). Rocky Marsh was assessed by PWFWCP and Ducks Unlimited (DU) biologists and identified as one of the best opportunities for wetland enhancement and wildlife viewing in the Parsnip River drainage. This wetland is important because of its relatively high productivity potential and its wide diversity of wildlife.

Prior to September 1999, when the main construction work was completed, beaver dams maintained the water levels in the wetland. The beaver dams held water levels up to 2 m deep, however, the beaver dams were often susceptible to failure and thus causing enormous fluctuations in the water level of the wetland over the past few decades. When the beaver dam was in failure as little as 25% of the wetland remained. Consequently, wildlife use and waterfowl production were dramatically reduced under those conditions due to a lack of cover, food, and over-water breeding areas for waterfowl.

The construction of the dam and water control was proposed to stabilize the water fluctuations in the wetland. If in the future water fluctuation were required to enhance production, the timing of the drawdowns and water fluctuations would be made at a time when they would have the least adverse effects on wildlife populations. With the enhancement work completed on this wetland (including the nesting structures), it is estimated that the area should produce 132 young ducks and geese per year. The stable water regime will also benefit common loons *(Gavia immer)*, grebes *(Podiceps* spp.), shorebirds, aquatic furbearers, and moose *(Alces alces)*. Proper management and maintenance of this stable water regime will ensure the long-term existence of this wetland for a wide variety of flora and fauna. The conservation of this wetland is also planned to provide public awareness and education opportunities through the viewing sites and the nature trails that were established as part of the project. The local tourism industry as well as local recreational activities will benefit from this work.

The following report documents the planning activities and enhancement work undertaken by PWFWCP and DU to complete the enhancement work at the Rocky Marsh wetland.

2.0 AREA DESCRIPTION

Rocky Marsh is located near the southern end of the Williston Reservoir, just 10 km south of the town of Mackenzie BC (figure 1). The wetland is situated approximately 1 km west of Highway #39 and can be easily accessed via gravel roads (figure 2). From Mackenzie travel south on Highway #39 for 9.3 km then turn right off the highway onto a gravel road that leads to Lions Lake. Travel down this road for 200 m then you will junction with a log hauling road for off-highway logging trucks (Finlay Causeway FSR), turn left onto this logging road and follow it for 0.5 km. At this point you will find a gravel road to the right, this road leads to the Rocky Marsh wetland. Follow this trail for

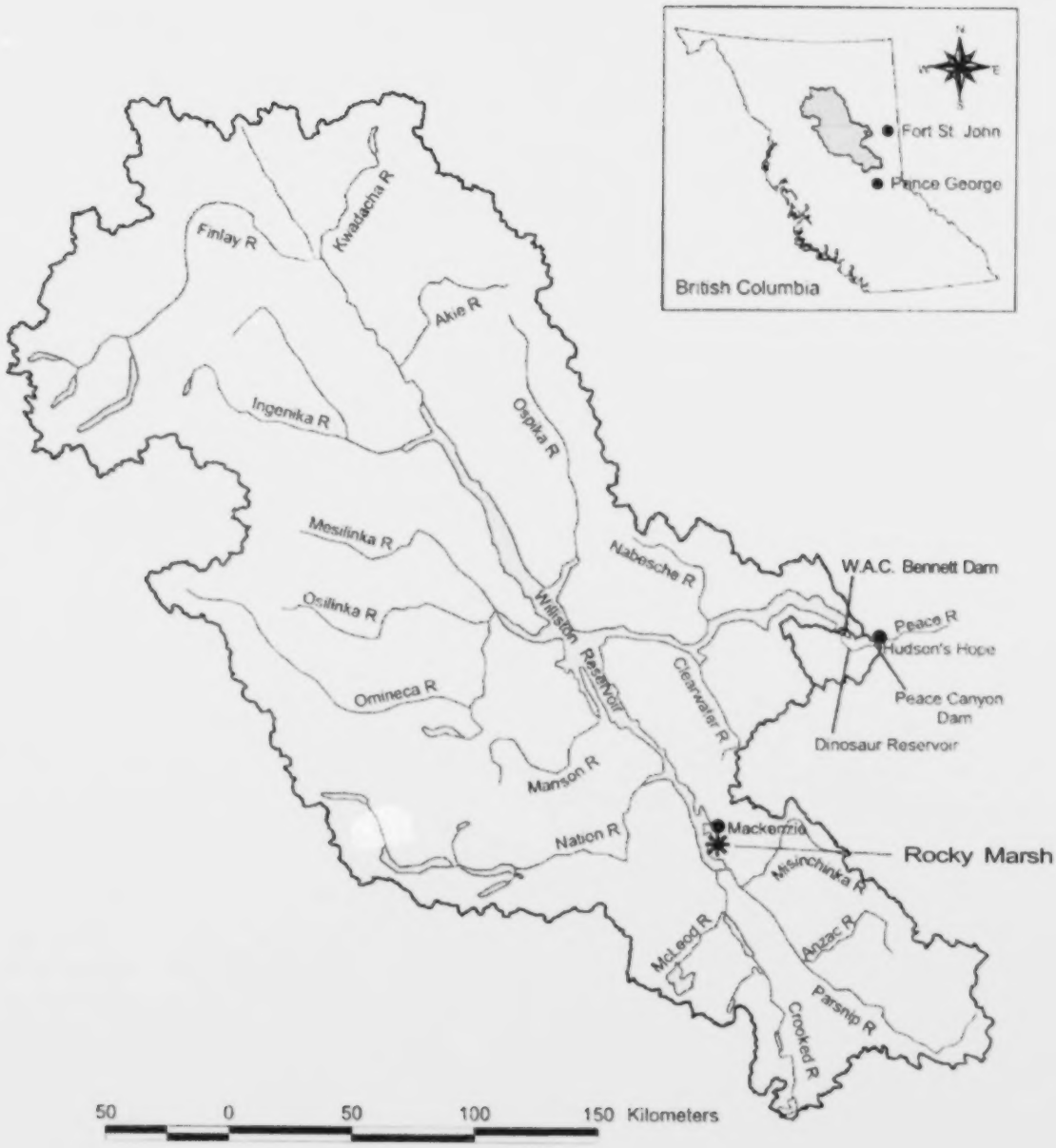


Figure 1. Location of Rocky Marsh wetland enhancement site within the Williston Reservoir watershed.

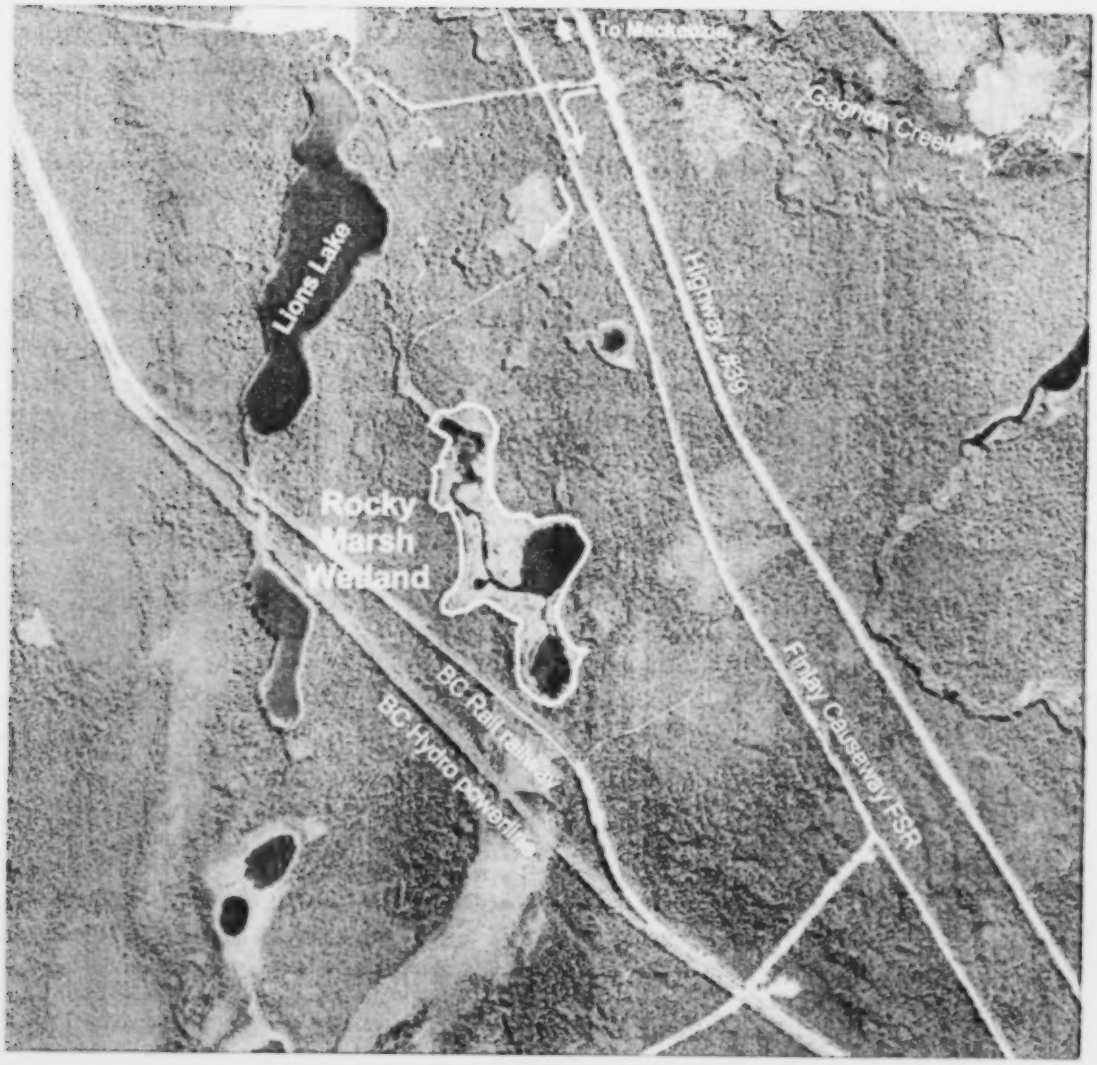


Figure 2. Rocky Marsh wetland and surrounding area.

0.9 km, at this point you will see a yellow gate on the right which is the access road to the Boy Scout Camp on Lions Lake, do not attempt to get through this gate, instead stay on the main road and follow it for another 300 m. At this point you should be at a large cleared area which was cleared as a parking lot for this project. From this point you must walk to the enhancement works following the various nature trails which are well mapped out.

The entire project is located on unsurveyed crown land within the municipal District of Mackenzie. The project is located in the southeast corner of the municipal boundaries. The UTM coordinates for the project are 10.4933.61220. The nearest surveyed land to the project is District Lot 5558 Cariboo Land District, property belonging to the local Boy Scout organization.

Adjacent water bodies to Rocky Marsh include Lions Lake and a smaller wetland that flows into Lions Lake from the south (figure 2). Besides these two wetlands there are a number of small sedge and black spruce wetlands, especially above Rocky Marsh on the incoming seasonal stream. Most of the wetlands above Rocky Marsh are affected by beaver activity. The water supply to Rocky Marsh is more than adequate to keep the wetland full all year long. There appears to be a number of small sub-surface streams (springs) that feed into Rocky Marsh. The outlet stream from Rocky Marsh flows in a well-defined stream to Lions Lake, which is located about 600 m downstream.

A large beaver dam on the outlet has maintained a variety of water levels on Rocky Marsh for more than five decades. However, the beaver dam has failed a number of times causing the wetland to become only a small remnant of its current status. These fluctuating water levels have caused great variations in wildlife use of the area as well as affecting the nesting success of many water-associated wildlife over the years.

At normal operating level (NOL - 684.4m assumed elevation, appendix A) the wetland is 25.3 ha in size and has 3.2 km of shoreline. The wetland has two large open water areas with a third smaller area adjacent to the dam site.

Surrounding these open water pockets are large areas of emergent vegetation composed of both sedge *(Carex* spp.) and cattail *(Typha latifolia)*. These two emergent plant species provide adequate cover for nesting waterfowl as well as providing brood hiding areas. These emergents are also used extensively by muskrats *(Ondatra zibethica)* for food and for making their pushups (homes). Much of the open water pockets are covered in submergent vegetation with the dominant plant species being, pondweeds *(Potamogeton* spp.), smartweeds *(Polygonum* spp.), bladderworts *(Utricularia* spp.), and waterlilies *(Nuphar* spp.). Submergent vegetation is important food sources for waterfowl, and other wildlife. Beavers *(Castor canadensis)* also feed on the rootstocks of waterlilies. This submergent vegetation also provides microhabitats for water invertebrates that many other fish and wildlife species utilize for food. Moose *(Alces alces)* also often utilize emergents and submergent vegetation for food. Water depths of up to 4.5 m are found in the centre areas of the open water pockets. However, for the

most part water depths throughout the basin are less than 2.0 m deep, with approximately 50% of the area being 1.0 m or less in depth.

The wetland basin perimeter is surrounded predominantly by woody vegetation. In a few areas there are narrow perimeters of grass and grass-type vegetation but for the most part willows *(Salix* spp.) and alder *(Alnus* spp.) dominate the upland habitat immediately surrounding the wetland. A mixture of various types of tree species dominates the area beyond the willow and alder. However, lodgepole pine (*Pinus contorta)* and trembling aspen *(Populus tremuloides)* along with black spruce *(Picea mariana)* in the wetter areas are the dominant tree species.

The Rocky Marsh area is within the moist, cool Sub-Boreal Spruce biogeoclimatic subzone (DeLong et al. 1993) and the Nechako Lowland Ecosection of the Sub-boreal Interior (Demarchi 1993).

3.0 PROJECT PLANNING

3.1 Biological Assessments

Baseline surveys were conducted to identify the flora and fauna present in the wetland. The initial biological reconnaissance survey of Rocky Marsh was conducted by DU in July 1988. The water transparency shown by a Sechi disc was 135 cm. The water pH was 8.0, while the hardness was 85.5 mg/l, and the alkalinity was 85.5mg/L CaCO3. The wetland basin is described as three deep-dish shaped bowls with large flat surrounding perimeters. The substrate was identified as organic for the most part, with organic material depths greater than 30 cm over sandy to gravelly type materials. Common plant species include: beaked sedge (*Carex rostrata),* slender sedge *(Carex lasiocarpa),* water sedge *(Carex aquatilis),* cattail *(Typha* spp.), spike rush *(Juncus arcticus),* bulrush *(Scirpus validus),* and manna grass *(Glyceria* spp.). The common submergent plant species include: sago pondweed (*Potamogeton pectinatus),* varying leafed pondweed *(Potamogeton gramineus),* water milfoil *(Myriophyllum magdalenense),* bur-reed *(Sparganium angustifolium),* bladderwort *(Utricularia vulgaris),* smartweed *(Polygonum* spp.), yellow waterlily *(Nuphar variegatum),* duckweed *(Lemna* spp.), coontail *(Ceratophyllum demersum)* and chara *(Chara* spp.).

During the July 1988 assessment, upland nesting by waterfowl was recorded as being limited because of the lack of good shoreline cover. Over water nesting sites were good at the higher water levels but definitely restricted during the lower water levels. Potential cavity nesting sites for buffleheads *(Bucephala albeola),* goldeneyes *(Bucephala* spp.) and hooded mergansers *(Lophodytes cucullatus)* are fairly limited due to the lack of suitable larger trees around the shoreline. Insular nesting sites for upland nesting waterfowl were somewhat limiting but were evaluated as fair. The irregular shoreline does provide some nesting opportunities for upland nesting but the heavily wooded shoreline does limit the number of sites available.

The DU reconnaissance and a number of subsequent visits since that time has reported a number of species of both diving and dabbling waterfowl that use the wetland. Ring-necked ducks *(Aythya collaris),* lesser scaup *(Aythya affinis),* mallards *(Anas platyrhynchos),* blue-winged teal *(Anas discors),* green-winged teal *(Anas carolinensis),* american wigeon *(Mareca americana),* bufflehead and goldeneye are the most common ducks utilizing the wetland. Other waterfowl such as the common loon *(Gavia immer),* Canada geese *(Branta canadensis),* horned grebe *(Podiceps auritus),* and red-necked grebes *(Podiceps grisegena)* have been sited on numerous occasions. All of the above waterfowl species are believed to nest on the wetland. Other wildlife of the area include muskrat, beaver, tree swallows *(Tachycineta thalassima),* red-winged blackbirds *(Agelaius phoeniceus),* northern flickers *(Colaptes auratus),* American kestrels *(Falco sparverius),* northern harrier *(Circus cyaneus),* moose, mule deer *(Odocoileus hemionus),* and black bear (*Ursus americanus)* to mention a few of the most prominent wildlife species. Invertebrates that were observed included water striders, snails, damsel and dragon fly nymphs, water boatman and gammarus. These invertebrates all appeared in relatively high abundance indicating that the wetland is fairly productive.

The Fisheries Branch of the Ministry of Environment, Lands and Parks completed studies of Lions Lake and associated watersheds in 1985 and 1989 (Jesson 1989). In 1989 the Ministry of Environment, Lands and Parks indicated that they had no concerns with any structures that were proposed for Rocky Marsh. A number of small minnow-type fish have been observed in the streams over the years.

3.2 Enhancement Planning

DU identified Rocky Marsh as a potential enhancement site on their July 1988 reconnaissance survey. This was followed by an engineering reconnaissance in September of 1988 to determine the cost feasibility of the proposed works. All efforts seemed to indicate a very viable project. For a number of reasons, including financial, the project lay stagnant for a few years. At the annual DU/PWFWCP/BC Ministry of Environment meetings in the spring of 1996 regarding interagency wetland enhancement plans, Rocky Marsh was identified as a potential cooperative project. DU and PWFWCP decided that Rocky Marsh would be a good project to get a number of local community organizations involved in and also to seek supportive funding from the Habitat Conservation Trust Fund (HCTF). A number of meetings were held in Mackenzie to seek out local interest. Several groups indicated a true interest in seeing such a project happen and that they would provide some in-kind contributions to ensure the project did come to fruition. The groups that came forward as active participants were the Mackenzie Boy Scouts, Mackenzie Cadets, Rocky Mountain Riders Snowmobile Club, Mackenzie Fish and Game Association, Mackenzie Nature Observatory Society, and Mackenzie High School - Woodlot Forestry Program. Three branches of government also participated in many of the meetings, Ministry of Environment, Lands and Parks, Ministry of Forests and District of Mackenzie.

Also in attendance at most meetings were representatives of Donohue Forest Products Inc (formerly Finlay Forest Industries), who identified that they were willing to participate in the project as a local corporate sponsor. With such enthusiasm from the local community, DU and the PWFWCP decided that they must try to get this project to completion as soon as possible.

DU in cooperation with PWFWCP collected all the survey data that would be required to complete such a project. In December 1996, a complete contour survey of the basin and surrounding upland was completed and subsequently drafted by DU. In June 1997 a water license was then applied for in the name of the Ministry of Environment, Lands and Parks with DU acting as agents. A conditional water license (#112529) was issued August 26, 1998. The license is for the storage of 300,000 cubic metres of water for conservation purposes. At the same time a permit (#22723) to occupy crown land was issued. DU developed all the engineering designs and cost estimates to complete the project during this period.

In both 1997 and 1998 proposals were prepared and submitted to the HCTF for partial funding of this project; both years' applications were turned down. The project was in jeopardy of dying. The PWFWCP in April of 1999 then decided they would provide all of the funding necessary to complete the construction phase of the project.

By October 1999 most of the physical works involved in the project had been completed. DU personnel let contracts and supervised these contracts to ensure that the work was completed on time and to the specified engineering designs.

A permit to cut timber was applied for at the local Ministry of Forests office and approval was received before construction work commenced. Also, a crown protocol agreement was signed between DU and the Ministry of Environment, Lands and Parks for the project. This process is a standard procedure for all projects in which DU is involved in on crown land. The agreement was signed August 2, 1999.

4.0 ENHANCEMENTS

4.1 Water Control Structure (variable crest drop inlet structure)

The instability of the beaver dam to maintain water levels on Rocky Marsh prompted the need to establish a permanent water control structure. Construction of an earthen dam with a corrugated metal pipe through it and a concrete drop structure on the inlet end of the pipe will mean that the water levels in the wetland can be held at the most beneficial water levels for wildlife. The earthen dam and associated structure has a life expectancy of greater than 30 years. Therefore, the wildlife of the area can rely on an area that will be consistent for them to produce young.

The actual construction site for the dam was immediately downstream of the old beaver dam on Rocky Marsh (figure 3). Construction of the dam and control structure took place in July and August 1999. This time period was selected because the ice-free water levels are at their lowest levels during this period, thereby making building easier and reducing any problems with downstream siltation. Detailed engineering plans for the dam and water control structure are provided in Appendix A. Photos of various parts of the work are illustrated in Appendix B.

The existing beaver dam was left in place during the construction of the earth-fill dam. Before the dam could be built, clearing of the dam and borrow sites had to occur. At the dam site, all organics and woody material was stripped off before the new fill could be laid down. The fill material was laid down in layers about 15 cm thick in order to allow adequate compaction. The soil from the borrow pit was relatively sandy so extra attention was required to ensure proper compaction occurred. Further, the soil turned out to be very dry so water had to be sprayed onto each layer to ensure it was wet enough for the correct compaction. Once the dam was to a height that it could be used as a road, the pipes and cutoff diaphragms were installed. The diaphragms prevent water seepage along the pipe when there is a hydraulic head on the upstream side; basically, the diaphragms prevent water from travelling along the pipe which could cause the water to wash away the soil and cause the dam to fail. Once the pipes were in place the earth fill was placed to the designed level. The spillway was then placed in the correct location and at designed elevation to allow it to carry any potential emergency water flows. The spillway elevation as designed by the engineers, was set to an elevation that was 0.3 m higher than the NOL, the height to which the drop structure is designed to hold water. A wooden catwalk was built from the dam out to the water control structure. Thereby, providing easy access to the drop structure for maintenance activities.

The last construction activity was cleaning up of the borrow pit to ensure it was left with safe slopes and contoured to the landscape. Upon completion of all the earth work, the entire site including all disturbed areas was seeded with a grass mixture suitable for the area. The site was fertilized to provide the grass seed with the desired nutrients to get it started. The grass was well established within a month of being planted.

A log boom was placed in front of the drop structure to prevent any floating debris from entering. The drop structure itself also has a steel grate on top to prevent blockages inside the structure. Further to the main dam and control structure construction, a parking lot area was built along the old logging road to provide the public with an area that they can drive to, and then walk from to see the project works and view the many wildlife species of the area (figure 3). The parking lot was covered with a 15-cm layer of gravel to help keep it dry for people visitors to the site.

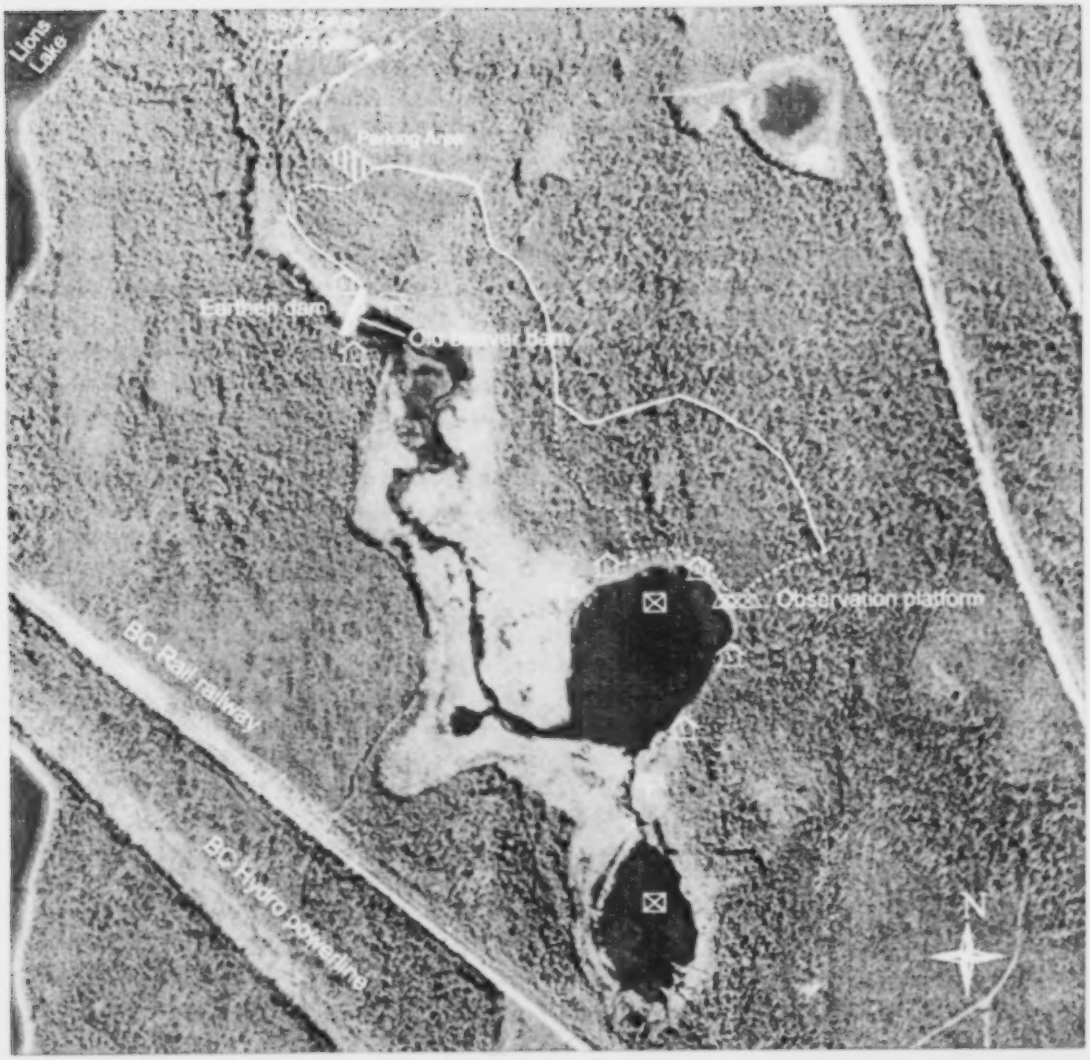


Figure 3. Rocky Marsh wetland and associated enhancements.

All trees removed from the work sites that were considered merchantable were made available to the Ministry of Forests so that they could be used by a local sawmill. Any of the remaining woody debris was left in piles for the Boy Scouts to use at their local camp. All other debris was buried.

4.2 Nesting Structures

DU personnel built nesting tunnels, nest boxes and floating islands for establishment at the Rocky Marsh wetland. The nesting structures were placed on site in March of 1998 by the Mackenzie Fish and Game Association, the Mackenzie Nature Observatory and the Rocky Mountain Riders Snowmobile Club. Members of the Rocky Mountain Riders Snowmobile Club transported the structures to the site and the Mackenzie Fish and Game Association and the Mackenzie Nature Observatory erected the nesting boxes and the nesting tunnels. PWFWCP personnel place the floating islands in their locations in August of 1998.

The structures consist of the following: 3 nesting tunnels, 6 nest boxes and 2 floating islands (figure 3). Nesting tunnels are cylinders placed on metal posts that are driven into the wetland so that the cylinder will be approximately the height of the top of the surrounding emergent vegetation. Grasses are placed inside the cylinder so that the waterfowl have nesting material. These structures are sometimes used by other waterfowl but are most often used by mallards. The nest boxes are used by hole-nesting ducks such as hooded mergansers, goldeneyes and buffleheads. The boxes are placed on trees around the wetland edge so that they are easily seen from the water area. The hole in the box is placed so it faces the open water. The boxes can be placed at various heights but are usually place at a height of 2 to 6 m above the ground. The nest box design used for these boxes is a standard design that DU has developed over the years. The floating islands are a wooden platform-type island developed by DU. The islands are constructed out of rough cedar boards with floatation billets to provide additional buoyancy. On the top of the floating island, to provide cover for nesting waterfowl, good potting soil is placed several inches thick then planted to a mixture of grass seeds. After seeding, fertilizer is added to get the seed off to a good start. The islands are held in place by two 50 kg concrete anchors attached to a steel cable that are placed on opposite corners of the island. The concrete anchors are dropped into the wet organic soils at the bottom of the wetland to provide secure anchorage of the island.

All of these nesting structures have a projected life of 10 years. However, DU has had some of these structures last much longer, especially with proper maintenance.

4.3 Project Awareness Initiatives (trails, signs and media releases)

The nature trail and observation sites were to be the responsibility of some of the local service clubs like the Boy Scouts and the Cadets as well as the High School-Woodlot Forestry Education. Some of the work was completed in the fall of 1999 but much of the work was left for the spring of the year 2000. The Boy Scouts managed to build the observation site. This is a small wood structure blended in to the natural terrain so as to provide for a good viewing site over the wetland. Most of the lumber for this structure was supplied by Donohue Forest Products Inc. DU and PWFWCP personnel constructed part of the nature trail from the old vehicle trail to the observation platform site so that the Boy Scouts could haul the materials into the viewing site.

In the spring of 2000, the nature trails are to be completed, as well all signs are to be built and erected on site. The nature trails will be the responsibility of the local community groups, while DU will be responsible for making the signs. The local groups will be responsible for the setting up of the signs on site.

Since Rocky Marsh is located so close to the town of Mackenzie, BC, it will provide the opportunity for local school classes, locals with an interest in nature, and tourists to visit the site and see various wildlife species indigenous to the area. Nature trails and observation points are being constructed to enhance these opportunities. The local Boy Scouts, which have a permanent campsite on Lions Lake, very near Rocky Marsh will be able to utilize the area as part of their nature and recreational activities.

During the dam construction phase of the project the access road into the site was enhanced to ensure that even two-wheel drive vehicles could drive to site. Although the road is not cleared in winter, the site is only a couple of kilometres off the main pave highway into Mackenzie, so even in the worst weather conditions access should not be too much of a problem.

During the construction phase of the project the local Mackenzie Times and the Prince George Citizen newspapers printed an article about the project. A news release that was prepared by the PWFWCP was used as a base for their articles. The articles basically expounded the benefits of the project to wildlife as well as the people (appendix C).

A clear path through the forest will provide a primitive nature trail allowing the public to access the wetland and an opportunity to view the nesting structures. The nature trail is scheduled to be constructed by the Mackenzie Boy Scouts and the Mackenzie Cadets. The trail will follow the old existing logging road in some areas, while in other areas the trail will meander through the forest to strategic viewing areas (figure 3).

Signs will be developed for the project once all work is completed, recognizing all those who participated in the project. The main sign will be a 1.2 m by 2.4 m sign in the parking lot area that has a map of the enhancement works and nature trail components. This sign will also identify the project name and all the participating organizations. Subject to approval by the Ministry of Highways and Transportation, the standard wildlife viewing directional signs will be placed along the highway to inform tourists and the local public of the site. Along the nature trails, at a few strategic locations, small information and directional signs will be erected. The wording for all signs will be reviewed and approved by both DU and PWFWCP.

5.0 PROJECT COSTS

Although not all project activities have been completed as of the writing of this report (ie signs and nature trail) the construction phase cost of the project is estimated at $128,557 (table 1). The costs include all work and activities except those considered biological in nature (ie reconnaissance surveys, waterfowl census, etc.). The project is estimated on a 30 year life cycle and all future maintenance costs are included it the total project cost, which is $187,000. There are however, a number of changes in the funding partnership since the early planning stages because HCTF did not contribute any money and PWFWCP agreed to pick up the HCTF share. This did not totally happen as DU agreed to share with PWFWCP 50% of all the construction supervisory costs. The end product when construction is completed will be that the following groups contributed the following financial funds to the construction phase of the project: DU - $30,338; PWFWCP - $83,819; Fish and Game - $2000; Boy Scouts - $7,600; Rocky Mountain Riders Snowmobile Club - $800 and the Cadets - $4000.

For the maintenance of the project the funding will be divided between PWFWCP and DU. The estimated funding required for the maintenance of the project over 30 years is $58,400. It is roughly estimated that DU's share of this will be 70% ($41,000) while PWFWCP will be 30% ($17,400). Future maintenance will include inspecting and maintaining the nesting structures and operation and maintaining the water control. Maintenance of the water control involves removing floating debris and materials place by beaver; on some occasions large construction machinery may be required to remove the debris. Other items that may have to be maintained or replaced are the signs and the viewing platform. The nature trail may also require minor maintenance from time to time. The staff at DU and PWFWCP will work together to coordinate all future maintenance work.

Table 1. Project costs for the activities associated with the planning and establishment of enhancements at Rocky Marsh. Note: No maintenance costs are shown in these totals. Total dollars includes charges of peoples time and GST where applicable.

Activity/Enhancement	Cost ($)	PWFWCP Contribution
PLANNING		
- Engineering recon. and feasibility	$2,400**	
- Maps, photos, and mosaic mapping	$2,500**	
- Engineering surveys	$5,600**	
- Drafting (preliminary and final)	$3,000**	
- Engineering design, costing and project evaluation	$6,000**	
- Legal agreements, permits, water licenses and negotiations	$3,600**	
- Contract tender documents, ordering materials, as builts, etc	$4,500**	
Total	$27,600	$10,000
DAM AND WATER CONTROL		
- Equipment contractors	$54,607	
- Materials purchased for site work	$ 8,575	
- Engineering supervision costs (time)	$15,275**	
Total	$78,457	$70,819
NESTING STRUCTURES		
- Floating islands (2)	$ 700	
- Nest boxes (6)	$ 150	
- Nesting tunnels (3)	$ 450	
- Labor to place structures	$2,000**	
Total	$ 3,300	$ 1,000
NATURE INTREPRETATION ENHANCEMENTS AND SIGNAGE		
- Treated Lumber and miscellaneous hardware	$ 400	
- Non-treated lumber donated by Donohue	$1,000	
- Labor to construct trails	$7,200**	
- Labor to construct viewing platform	$2,400**	
- Labor to construct walking bridge	$1,600**	
- Labor (man time) to formulate design and contract	$3,200* **	
- Labor to erect signs	$2,400* **	
- Cost of contract to build signs	$2,000*	
Total	$19,200	$ 2,000
TOTAL PROJECT	$128,557	$83,819

* - This cost is an estimate only as work is not completed

** - These are the labor components

In a quick review of the project costing from table 1 it shows that PWFWCP has contributed $83,819 to the project. Of the total contributed $10,000 was contributed prior to the 1999/2000 fiscal year. This means that $73,819 was contributed in the 1999/2000 fiscal year and this was through the contribution agreement between DU and PWFWCP.

6.0 FUTURE MONITORING AND MAINTENANCE ACTIVITIES

The water control on Rocky Marsh was constructed to benefit wildlife, however should the selected water levels not obtain the desired results then changes or manipulations may be required to the water regime. The regime is subject to and dependent upon the Conditional Water License issued for the project. These changes will only occur upon mutual consent of the PWFWCP, DU and the Fish and Wildlife Branch of the Ministry of Environment, Lands and Parks. The maintenance, operation, and management of the water level control (in accordance with the Crown Protocol Agreement) is the responsibility of DU. DU and PWFWCP will monitor water levels in any given year. Monitoring of habitat conditions will be undertaken by DU through biological inspections and on an incidental basis. A standard biological inspection is scheduled to occur once in the first 5 years following construction. Frequency of future inspections will be determined by DU in consultation with the PWFWCP and the Ministry of Environment, Lands and Parks. Records of inspections and recommendations will be kept by DU and made available upon request. Engineering inspections will be made by DU as they determine they are required.

The maintenance and monitoring of nesting structures will occur by DU or PWFWCP every 2 to 4 years depending on the needs as determined by the two parties. DU and/or PWFWCP will install replacement-nesting structures as required.

DU and/or PWFWCP will complete any work required to maintain the water control structure so that it is free from debris. In some years this may involve hiring an excavator-type machine to remove mud and sticks from the front of the control.

7.0 CONCLUSION

The work undertaken at the Rocky Marsh wetland is consistent with the goals and objectives of both DU and the PWFWCP. It was also an excellent opportunity for the two organizations to cooperate and jointly seek public support and funding for this project. More importantly, the enhancements help promote and sustain ecological diversity in the wetland and its surrounding habitat as well as providing opportunities for public education, recreation and enjoyment of the areas natural resources.

8.0 REFERENCES

In addition to the below stated reports, information contained in this report was compiled from Peace/Williston Fish and Wildlife Compensation Program and Ducks Unlimited Canada (Prince George) project files.

Davidson, P.W. and R. Dawson. 1990. Williston Wildlife Compensation Program Management plan, 1990. Peace/Williston Fish and Wildlife Compensation Program Report No. 5. 44pp.

Demarchi, D. 1993. Ecoregions of British Columbia, 4th ed. 1:2,000,000 map.

DeLong, C., D. Tanner, and M.J. Jull. 1993. A field guide for site identification and Interpretation for the southwest portion of the Prince George Forest Region. BC Ministry of Forests, Victoria, B.C. 290pp.

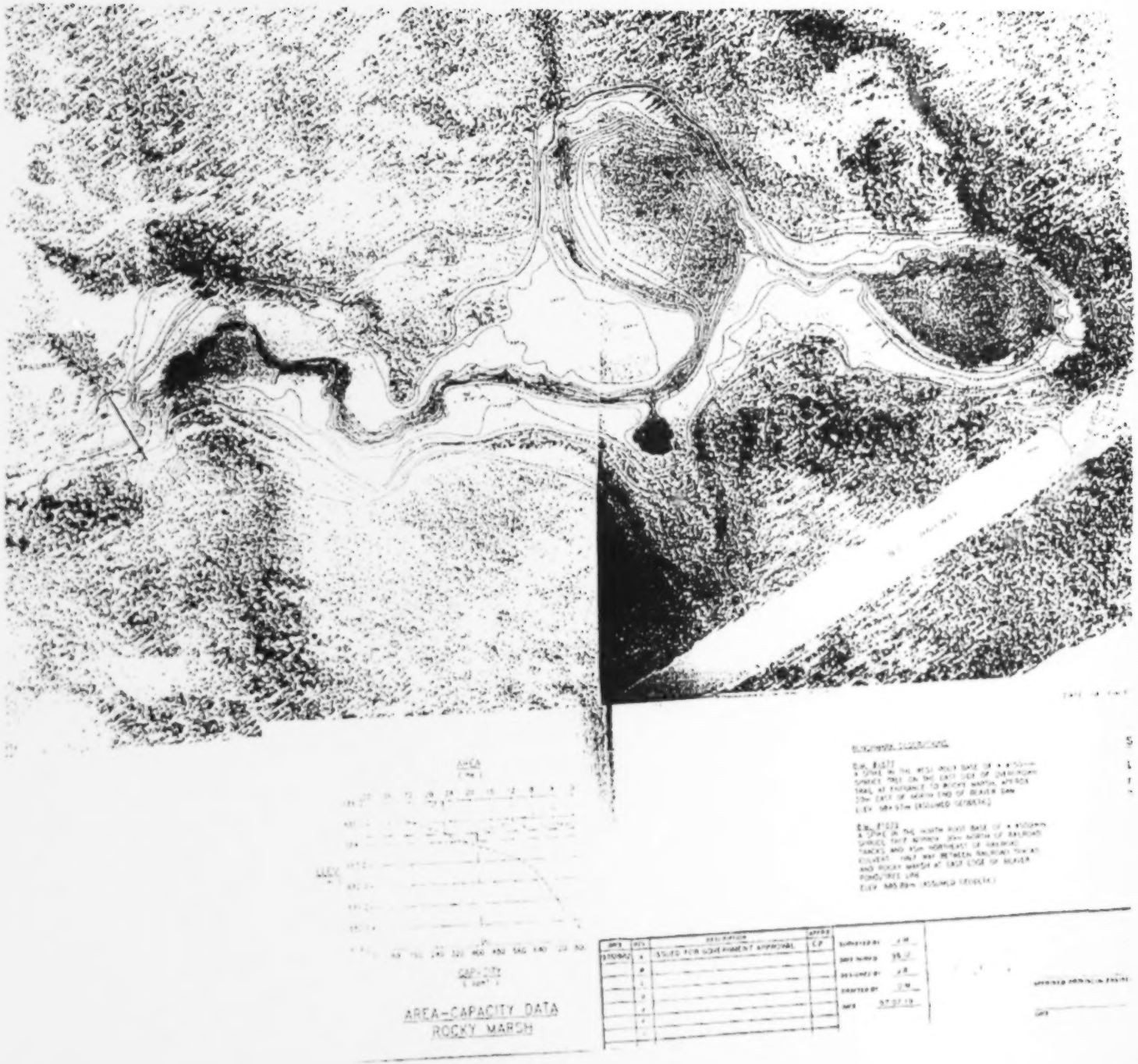
Jesson, D. 1989. Williston Lake Project Small Inventory and Enhancement Program, Technical Aspects of the Chemical Treatment of Lions Lake and Proposed Lions Lake Management Plan

APPENDIX A

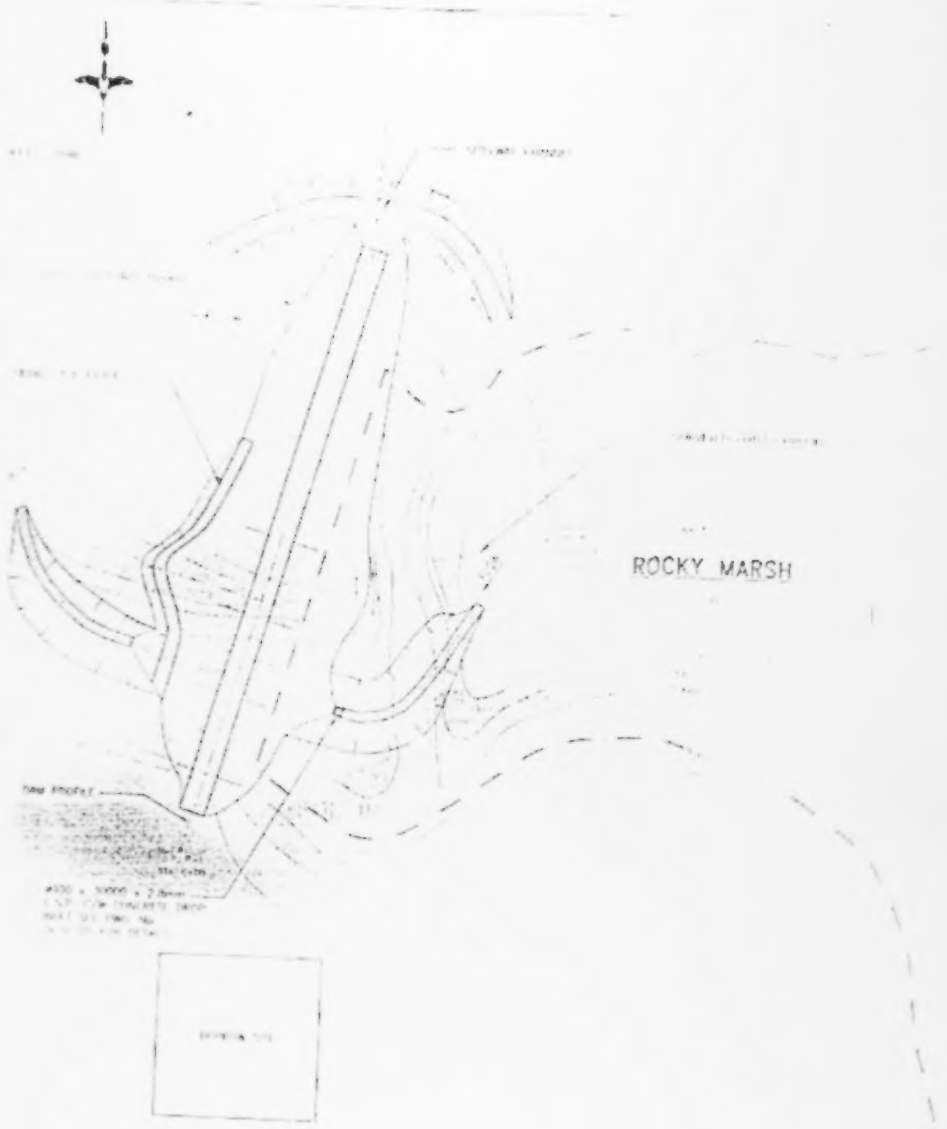
Engineering plans for

the drop structure at

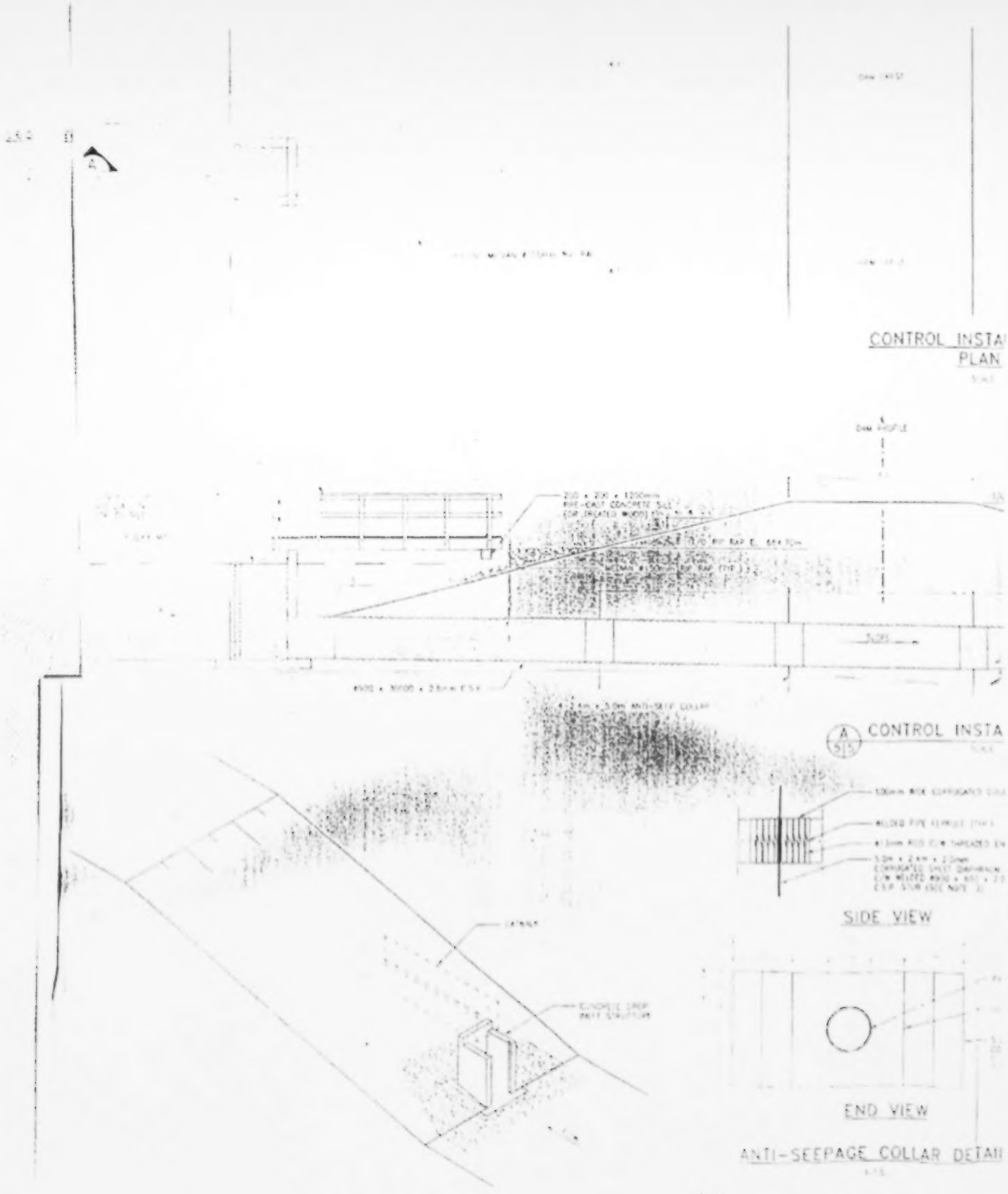
Rocky Marsh



AREA-CAPACITY DATA
ROCKY MARSH



DAM SITE PLAN



CONTROL INSTA
PLAN

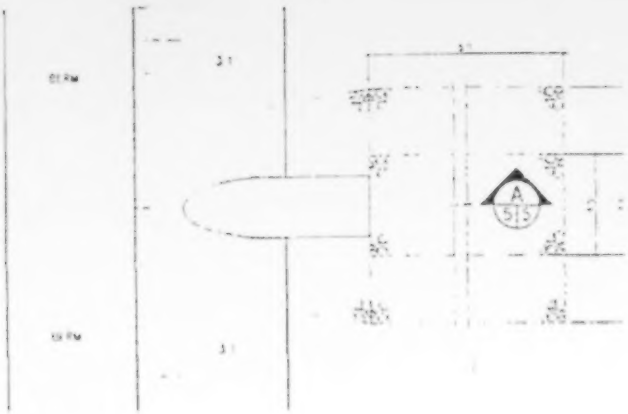
CONTROL INSTA

SIDE VIEW

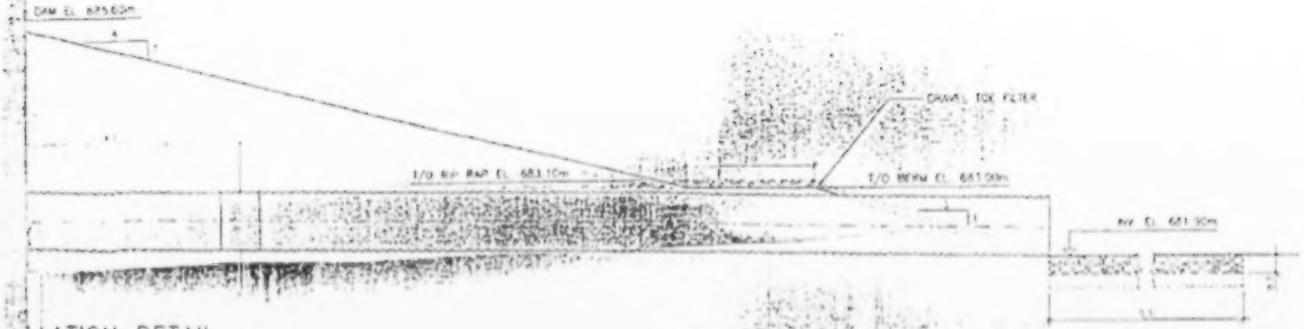
END VIEW

ANTI-SEEPAGE COLLAR DETAI

CONCRETE DROP INLET
ISOMETRIC VIEW



LLATION DETAIL
VIEW
1 : 50



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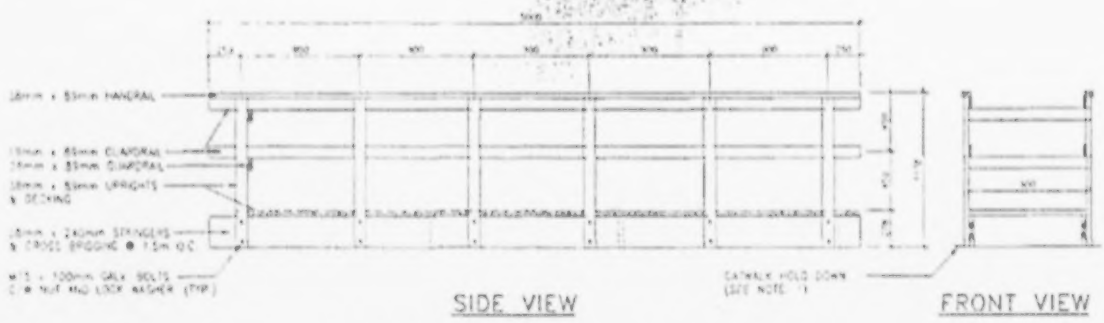


SIDE VIEW

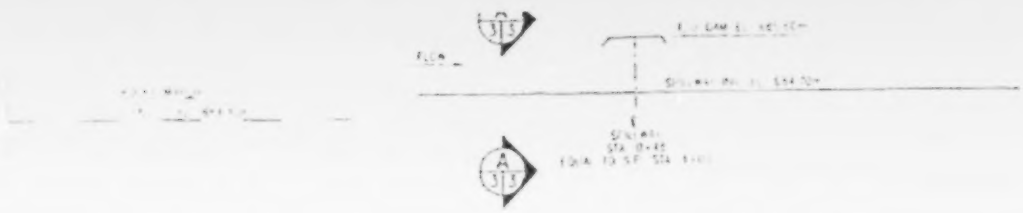
FRONT VIEW

CATWALK FABRICATION DETAILS

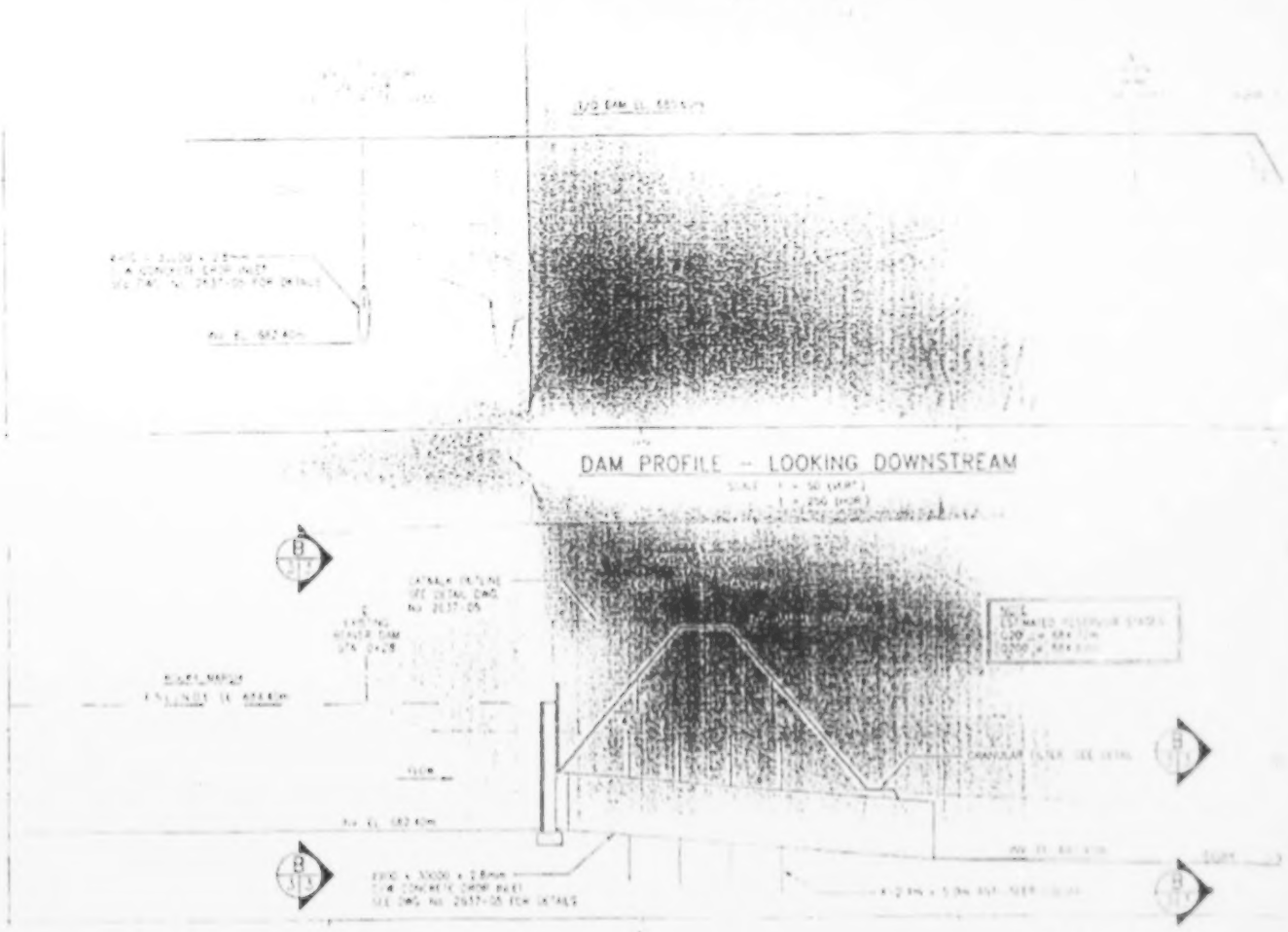
SCALE 1 : 25

NOTES

ROCKY MARSH
CONTROL INSTAL
DETAILS



SPILLWAY PROFILE



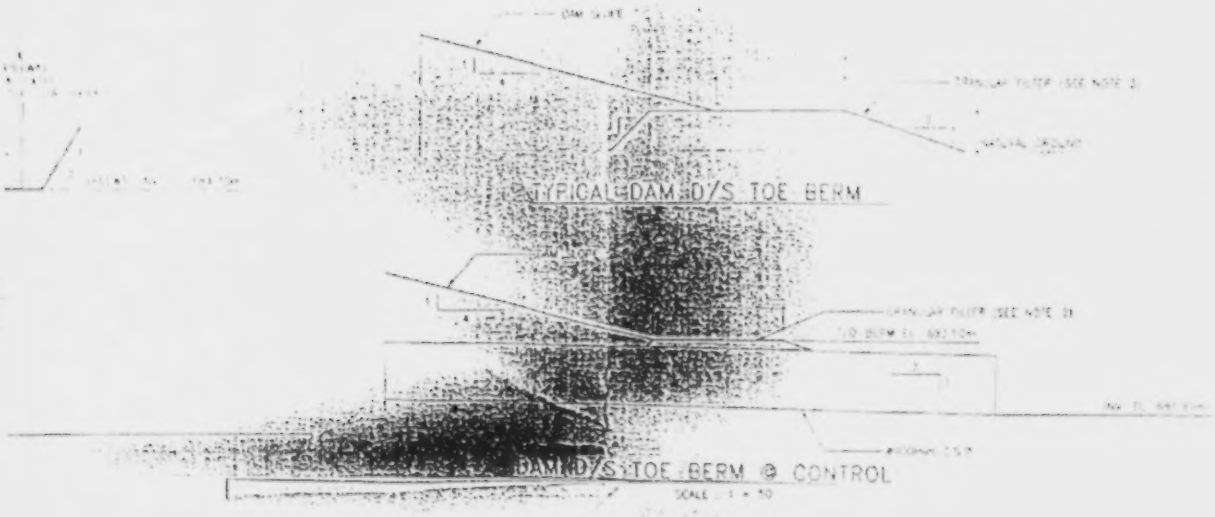
DAM PROFILE – LOOKING DOWNSTREAM

OUTLET PROFILE

OUTLET PROFILE (CONT'D)

A SPILLWAY SECTION

B TYPICAL DITCH SECTION



NOTES

1. THE FOLLOWING CLAUSES IN MANITOBA SPECIFICATIONS APPLY:
   a) DM 202-R3 - MOBILIZATION & DEMOBILIZATION (INCIDENTAL)
   b) DM 241-R3 - PROTECTION OF THE ENVIRONMENT
   c) DM 202-R1 - CLEARING AND GRUBBING
   d) DM 240-R1 - SEEDING
   e) DM 270-R2 - CARE OF WATER
   f) DM 207-R3 - STRIPPING AND PLACEMENT OF TOPSOIL
   g) DM 209-R2 - DITCH AND CHANNEL CONSTRUCTION
   h) DM 410-R2 - EMBANKMENT CONSTRUCTION (EARTH LIKE)
   i) DM 410-R1 - GRANULAR MATERIAL
   j) DM 411-R2 - RIP RAP PLACEMENT
   k) DM 502-R2 - TOPSOIL REINSTATEMENT
   l) DM 524-R1 - STRUCTURAL CONCRETE

2. ALL RIP RAP WITHIN DAM TRENCH FILLED ON INSIDE SIDE OF TRENCH PLUG TYPE.

3. A GRAVEL TO FILTER SHALL BE CONSTRUCTED BETWEEN STA 2+12 TO STA 0+43 ALONG D/S TOE OF DAM AND AROUND THE END OF GUIDE DYKE (EXACT LOCATION TO BE STAKED IN FIELD). MATERIAL TO BE USED AS FILTER TO RANGE FROM 20 mm - 10mm (SAND GRADE) TO MEDIUM SAND - PRIOR APPROVAL BY ENGINEER.

4. EXCESS MATERIAL IS TO BE SPREAD FROM THE EMBANKMENT SIDE SLOPES ALONG THE D/S SIDE OF EMBANKMENT AND LATER GRADED TO FORM A BERM WITH A TOP ELEVATION OF [illegible].

5. THE BOTTOM WIDTH OF THE MAIN-STEP DIMENSIONS IS TO BE TAKEN FROM EXISTING NATURAL UNDISTURBED GROUND TO MATCH GRADE OF [illegible].

6. [illegible] DURING ACTION THE WATER LEVEL WILL BE [illegible] TO ALLOW [illegible].

Ducks Unlimited Canada

ROCKY MARSH

DAM & OUTLET

PROFILES

DWG No. [illegible]

APPENDIX B

Rocky Marsh

wetland enhancement

photographs

Photo #1 - Overview of Rocky Marsh from the southeast, before construction, looking toward the dam site. Proposed dam site in upper centre. 1999/07/18

Photo #2 - Overview of Rocky Marsh from the northwest looking southeast, before construction, 1999/07/18

Photo #3 - Ground view of Rocky Marsh looking over one of the open water pockets. A nesting tunnel in centre left. 1999/09/25

Photo #4 - Old logging road that is now part of the nature trail. 1999/06/19

Photo #5 - Dam construction at Rocky Marsh. 1999/08/11

Photo #6 - Watering down the soil to ensure better soil compaction during dam construction. 1999/08/11

Photo #7 - Downstream slope of dam with good grass establishment, shortly after construction was completed. 1999/10/01

Photo # 8 - Upstream slope of dam with excellent grass establishment, shortly after construction was completed. 1999/10/01

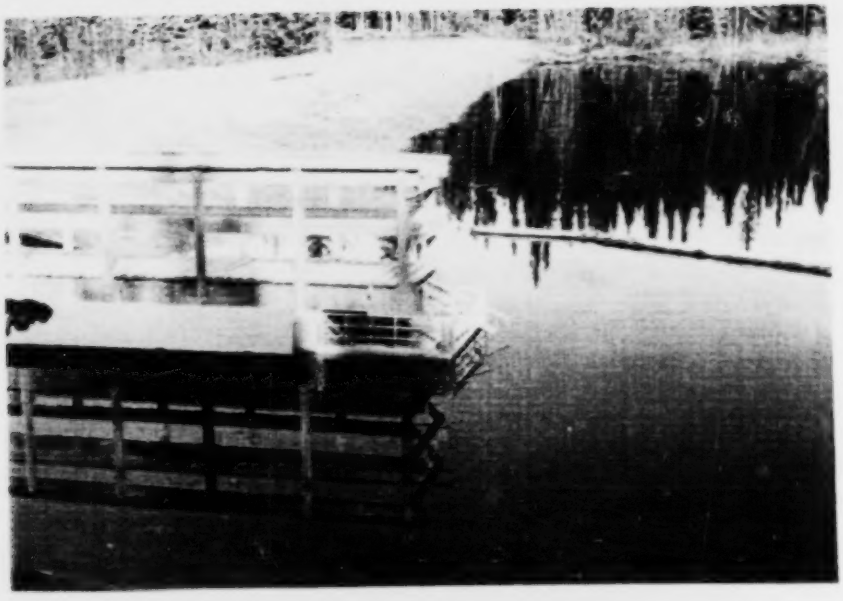


Photo #9 - Catwalk, water control, dam and log boom on Rocky Marsh.
1999/10/01

Photo #10 - Overview of catwalk, water control, dam and log boom
on Rocky Marsh. 1999/10/01

Photo #11 - Dam site area with excellent grass establishment shortly after construction was completed. 1999/10/01

Photo # 12 - Spillway with excellent grass vegetation. 1999/10/01

Project Photos of Rocky Marsh Wetland Enhancement

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Photo #12 - Spillway with excellent grass vegetation. 1999/10/01

APPENDIX C

Media releases regarding

the Rocky Marsh

wetland enhancement project

Media Releases

1. PWFWCP news media release
2. Article in the Prince George Citizen (July 21, 1999)
3. Article in the Mackenzie Times (July 27, 1999)

Peace/Williston Fish and Wildlife Compensation Program
1011 Fourth Ave., third floor
Prince George, B.C., V2L 3H9

July 20,1999

CONTACT: Tony MacGregor
Prince George (250)561-4892
or
Fraser Corbould
Prince George (250) 565-6856

Rocky Marsh Project aims to conserve wetland and provide viewing opportunities

PRINCE GEORGE - The Rocky Marsh wetland near Mackenzie will be preserved for future generations thanks to a huge community effort and a partnership between the Peace/Williston Fish and Wildlife Compensation Program (PWFWCP) and Ducks Unlimited.

The wetland, located about 11 km south of Mackenzie and about 1 km from Highway 39, has been maintained periodically over the decades by a beaver dam, which is now in danger of collapse. An earthen dam will be constructed to replace the failing beaver dam and conserve for the long-term the 25-hectare wetland, which is home to over 15 waterfowl species, several aquatic fur-bearing creatures such as muskrat, and dozens of songbirds. Other wildlife species such as moose, bats and amphibians also make use of the wetland.

"If the beaver dam breached we would lose 70 per cent of the wetland," said Fraser Corbould, a biologist with the PWFWCP.

He explained that the project has deep support within the community and that several Mackenzie community groups have been involved in the development of the project over the past few years.

Volunteers from Mackenzie have already helped with enhancing the site by installing various nesting structures: floating platforms for geese, nesting tunnels for mallards, and nest boxes for cavity-nesting songbirds and ducks such as buffleheads and goldeneyes. In the fall, many other volunteers will help build nature trails and a low-elevation observation platform, and erect project signs.

"Residents and tourists will be able to enjoy viewing wildlife while at the same time we will be conserving and enhancing wildlife habitat," said Corbould. He expects that some of the approximately 4,000 people who visit Mackenzie each year between May and August will take advantage of viewing opportunities at the site.

The project will cost over $100,000, not including donations from local companies and volunteer time. The creation of the dam started July 20 and will finish in early August.

Four local companies have been contracted to work on the project or provide materials: Cordwood Industries, Notlih Investments Ltd., Lee-Vine Holdings, and Sonic Concrete and Aggregate. Including Ducks Unlimited engineers, about eight persons are expected to work on the dam construction phase of the project.

Volunteers from the following Mackenzie groups have committed to help: Mackenzie Nature Observatory, Mackenzie Scouts, the Mackenzie Air Cadets, Mackenzie Secondary School (Woodlot Forestry Program), the Rocky Mountain Riders Snowmobile Club, and the Mackenzie Fish and Game Association.

Finlay Forest Industries Ltd. will be donating timber for the project. The Mackenzie Forest District, BC Environment, and the District of Mackenzie have also contributed to the project.

Corbould explained that the key partnership in the project is between the PWFWCP and Ducks Unlimited. "The PWFWCP is supplying most of the funds while Ducks Unlimited is supplying the engineering expertise and administrative support," he said.

The PWFWCP is a partnership between BC Hydro, the Ministry of Environment and the Ministry of Fisheries. Its mission is to conserve and enhance fish, wildlife and their habitats within the watersheds of the Williston and Dinosaur reservoirs for the future.

30

Visit Peace/Williston Fish and Wildlife Compensation Program web site at:
www.bchydro.bc.ca/environment/pwcp

SECOND FRONT

Earth dam will save Mackenzie wetland

Work started Tuesday building an earthen dam to preserve Rocky Marsh, a 25-hectare wetland near Mackenzie, says a press release from the Peace/Williston Fish and Wildlife Compensation Program.

The wetland, located 11 kilometres south of the town a short distance off Highway 39, was created by a beaver dam which is now in danger of breaking, says the news release.

It is home to more than 15 species of waterfowl, several aquatic fur-bearing animals like muskrat and dozens of songbirds. Other wildlife such as moose, bats and amphibians also rely on the wetland, it said.

"If the beaver dam breached we would lose 70% of the wetland," said Fraser Corbould, a biologist with the program.

The project is being done through a partnership between the compensation program which is responsible for most of the $100,000 needed for the work and Ducks Unlimited, which is supplying engineering expertise and administrative support.

About eight people will be involved in the actual construction, expected to be completed in early August, the news release said.

"Residents and tourists will be able to enjoy viewing wildlife while at the same time we will be conserving and enhancing wildlife habitat," Corbould said, adding he hopes some of the 4,000 people who visit Mackenzie each summer will take advantage of viewing opportunities at the site.

The project is being supported by Finlay Forest Industries, Cordwood Industries, Notlih Investments Ltd., Lee-Vine Holdings, Sonic Concrete and Aggregate, the Mackenzie Forest District and the District of Mackenzie.

Volunteers include: Mackenzie Nature Observatory, Mackenzie Scouts, Mackenzie Air Cadets, the woodlot forestry program at Mackenzie secondary school, the Rocky Mountain Riders Snowmobile Club and the Mackenzie Fish and Game Association.

The Peace/Williston Fish and wildlife Compensation Program is a partnership between B.C. Hydro, the Ministry of the Environment and the Ministry of Fisheries.

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THE MACKENZIE TIMES

60¢
(GST INCLUDED)

VOLUME 23, ISSUE 30
TUESDAY, JULY 27, 1999

Discovering the Arts

Balloons, ice cream buckets, and toilet paper rolls are just a few of the things used in creating a piece of paper mache work.

Kaitlyn Zirk, Elisa Fuller, Kenna Freeman, Tiffany Page, Heidi Bradley, Eric Martin and Louis Francis are busy preparing to make an Alien out of paper mache.

This is the first time ever that an Art Camp has been offered by the Mackenzie Arts Council for children.

The camp provides a variety of courses for children to participate in, such as sketching, painting, clay play and paper mache.

The nice thing about the course is that the instructors are local members of the Mackenzie Arts Council sharing their knowledge and talent with the children. *photo by J. Benton*

Vandals Strike at Rec Centre

by J. Benton

Last week, the stairs on the side of the curling rink were torn off and a structure beam was broken. Damage was also done to the arena door, alarms were set off and flowers were torn up out of the flower beds.

If you have any information on this incident, please call the RCMP at 997-3288.

Necessity is the Father of Ingenuity

When Marc Allen-Lafontaine, 13, discovered the joys (obsessions) of golfing, he also discovered one big problem. How could he get to the golf course each day without his parents having to drive him?

He presented this dilemma to his father, Sylvain, and of course "Mr. Inventor" went to work. Soon he came up with a prototype of a unique bike trailer specifically designed to transport a golf bag, and a golf cart, if necessary. With some help from friends at work, Sylvain designed a simple but effective trailer made from lightweight tubing and bike tires.

Now Marc can be spotted biking back and forth to the golf course, at his leisure, instead of having to arrange rides when his parents are able (or willing!) Good exercise on an environmentally friendly vehicle.

Sylvain has also developed some additional features to the bike trailer such as turning it into a golf cart once the handle is disengaged. He has even initiated the first stages of having his design patented. But even if that doesn't go through, having his son Marc enjoy it with such pride is treasure enough.

Rocky Marsh Project

aims to conserve wetland and provide viewing opportunities

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